

A2  
cont.

said buffer agent [being capable of adjusting] adjusts a pH of said sample solution to a proper pH for the activity of an enzyme in the biosensor.

6. (Amended) The sample solution treating instrument in accordance with [claim 1] claim 8, further comprising a heating means of said sample solution.

7. (Amended) A method for treating a sample solution comprising the steps of: introducing a sample solution, which will be supplied to a biosensor for analysis, into the sample solution treating instrument as claimed in [claim 1] claim 8, and

adjusting said sample solution [closest] to a proper condition for analysis with said biosensor.

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Please add new claims 8, 9 and 10.

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-- 8. A sample solution treating instrument for formulating a sample solution to be supplied to a biosensor for analysis, comprising a sample introducing part to which the sample solution is introduced, a control means for converting said sample solution to a condition for analysis with said biosensor, and a sample releasing part for supplying the converted sample solution to said biosensor.

9. The sample solution treating instrument in accordance with claim 8, wherein said sample introducing part and said sample releasing part are at different positions, said control means is located between said sample introducing part and said sample releasing part, and the sample solution, having passed through said control means, is released from said sample releasing part.

10. A sample solution treating instrument for formulating a sample solution to be supplied to a biosensor for analysis, comprising a sample treating unit which contains a substance for converting the sample solution to a condition for analysis with said biosensor, and a sample supply unit which is made of an elastic material for retaining the sample solution inside the sample supply unit. --

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### REMARKS

Claims 2-10 are presently pending. Claim 1 has been rewritten as new claim 8. Claims 2 and 4-7 have been amended to change claim dependencies in light of the cancellation of claim 1, and to render the claims more fully compliant with the PTO's formal requirements

for claims. New claims 9 and 10 have been added to claim the specific embodiments in Figures 5 and 4, respectively. Accordingly, no new matter is added by the amendments.

New claims 8, 9 and 10 have been added. No new matter is added by these claims; support for each new claim is found at least in Figures 4 and 5 of the specification, as initially filed, and at page 20, lines 17-19 (supporting use of the term "sample treating unit").

**I. Rejections Under 35 U.S.C. §112, Second Paragraph.**

The Examiner has rejected claims 1-7 under 35 U.S.C. §112, second paragraph, for indefiniteness. Specifically, the Examiner has asserted that use of the term "proper", a relative term, in claims 1 and 5, renders the claims indefinite. The applicants respectfully traverse this rejection for the reasons given below.

The fact that claim language, including terms of degree and relative terminology, may not be precise does not automatically render the claim indefinite under 35 U.S.C. §112, second paragraph. M.P.E.P. 2173.05(b), citing *Seattle Box Co. v. Indust. Crating & Packing, Inc.*, 731 F.2d 818 (Fed. Cir. 1984) (emphasis added). Acceptability of the claim language, including the relative terms, depends upon whether one of ordinary skill in the art would understand what is claimed, in light of the specification. *Id.* At page 7, lines 1-13, the term "proper", as used in claim 5, is defined as "control[ling] the sample solution to have an adequate pH range . . . for the activity of the enzyme to be used." Accordingly, it is respectfully requested that the Examiner reconsider and withdraw her rejection of pending claims 2-7 for indefiniteness.

The Examiner has also rejected claim 5 for use of the term "capable". The applicants have amended claim 5 by eliminating the language "being capable of adjusting" and substituting "adjusts". In light of this amendment, it is submitted that the Examiner's rejection is no longer applicable. Reconsideration and withdrawal of the rejection are respectfully requested.

Finally, the Examiner has rejected claim 7 for use of the language "closest to a proper condition". The applicants have amended claim 7 to eliminate use of the term "closest". Thus, the second step of the method of claim 7 is "adjusting said sample solution to a proper condition for analysis with said biosensor". As was discussed above, the language "proper condition" is not indefinite if read in light of the specification. Specifically, at least at page 7, lines 1-14, it is indicated that the language "proper condition" is defined as "control[ling] the condition of the sample solution by eliminating adverse influences of . . . interfering substances

on the measurement results or control[ing] the sample solution to have an adequate pH range or temperature range for the activity of an enzyme to be used.”

In light of the foregoing, it is respectfully requested that the Examiner reconsider and withdraw her §112, second paragraph, rejection of claim 7.

## **II. Rejections Under 35 U.S.C. §102(b).**

The Examiner has rejected each of claims 1-7 as anticipated under 35 U.S.C. §102(b) based upon one or more of the following references:

- U.S. Patent No. 5,262,305 of Heller *et al.*, entitled “Interferant Eliminating Biosensors” (“Heller”);
- U.S. Patent No. 5,124,253 of Foulds *et al.*, entitled “Dry Strip Element for the Electrochemical Detection of Theophylline” (“Foulds”);
- U.S. Patent No. 5,229,282 of Yoshioka *et al.*, entitled “Preparation of a Biosensor Having a Layer Containing an Enzyme, Electron Acceptor, and Hydrophilic Polymer on an Electrode System” (“Yoshikoa ‘282”);
- U.S. Patent No. 5,192,415 of Yoshioka *et al.*, entitled “Biosensor Utilizing Enzyme and a Method for Producing the Same” (“Yoshikoa ‘415”);
- U.S. Patent No. 4,431,507 of Nankai *et al.*, entitled “Enzyme Electrode” (“Nankai”);
- U.S. Patent No. 5,271,813 of Bockowski, entitled “Method of Detection Using Sensor Electrode” (“Bockowski”);
- U.S. Patent No. 5,385,830 of Amano *et al.*, entitled “Apparatus for Measuring Free and Total Sulfurous Acid and Method of Measurement (“Amano”).

The applicants respectfully traverse the Examiner’s §102(b) rejections for the reasons given below.

### **The Invention**

The invention of this application is a sample solution treating instrument that allows for the simple adjustment of a sample solution, such as sake moromi or a nutritional drink, to place it in a condition suitable for more rapid and more accurate analysis by an external biosensor. The sample solution is treated in the control means of the sample solution treating

instrument which is equipped to place the sample solution in proper condition for biosensor analysis, by use of various buffer agents, adsorbents and/or catalysts, depending on the types of sample solutions and or biosensor involved. For example, the control means may contain catalysts which are capable of converting interfering substances such as vitamin B<sub>2</sub>, vitamin C, tannic acid or anthocyanin into “harmless” substances which a biosensor is less likely to erroneously detect as an analyte. The control means may also contain an adsorbent material which may function to adsorb and remove any interfering substances, or it may contain a buffering agent which can act to adjust the pH to a level at which the enzyme contained in the biosensor may function more efficiently.

As is described in the background section of the specification and in some of the prior art of record, conventional practice for detection of an analyte may utilize a biosensor having a component, integral to or in close proximity with the biosensor electrode, which contains an additional means intended to act to remove or neutralize any interfering substances in order to place the solution in a better condition for the detection reaction. This additional means does not function in the detection reaction, which is the primary activity of the biosensor, but is complementary to such activity.

Detection processes using a biosensor configured in this manner suffer from several drawbacks. For example, because the biosensor and the additional means are exposed to the sample solution almost simultaneously, the conditioning of the sample solution is not necessarily completed before the analyte detection reaction is accomplished. Thus, the measurement obtained may still be substantially affected by interfering substances. Additionally, use of biosensors containing a conditioning means integral to or in close proximity with the biosensor electrode does not permit use of the same biosensor with different sample solutions, if such solutions contain disparate interfering substances having differing chemical behaviors, and which therefore may not necessarily be efficiently eliminated or reduced in the same manner.

The Examiner has cited seven references, asserting that each individual reference anticipates the claimed invention. The Examiner contends that Heller teaches a biosensor including an interferant eliminating catalyst. Heller discloses a biosensor having an electrode substantially covered by a “sensing layer”, and, on top of the sensing layer, “an interferant-eliminating layer” containing a catalyst which is capable of oxidizing and thereby eliminating

interfering substances, and a third outer “oxidant-generating layer.” *See, e.g.*, Fig. 3. The Heller layered electrode may be placed in a cell to which sample solution is added or it may be inserted in sample solution.

Foulds discloses a dry strip element to be used in an electrochemical assay method for detecting theophylline in human biological fluids. The element is made up of a working electrode and a reference electrode. At the working electrode is an alkaline phosphatase and an electroinactive phosphate ester. The dry strip element may also incorporate a buffer having a pH of 9 to 10, and the buffer is positioned between the region of the sample application and the alkaline phosphatase. Fould teaches that one may incorporate into the test element isozymes to remove any alkaline phosphatase endogenous to the sample. This may reduce the desired substrate prior to the detection reaction, but will not interfere with the detection reaction itself.

Yoshioka '282 teaches a biosensor made up of an electrode surface having a reaction layer and an optional hydrophilic polymer layer. Although Example 1 teaches use of glucose oxidase in the reaction layer, as the Examiner pointed out, the oxidase is present to detect glucose, *i.e.*, to perform the task of the biosensor, not to aid in the removal of interfering substances. Further, contrary to the Examiner's assertion, the glucose is not an interferant, but is the substance being detected by the biosensor.

Yoshioka '415 discloses a biosensor for the detection of glucose made up of an electrical insulating substrate, an electrode system including a working electrode and a counter electrode, and a reaction layer in contact with the electrode system. The reaction layer includes an enzyme and a hydrogen ion concentration control, both of which are required in order to perform the detection reaction. No means of removing, reducing or eliminating interfering substances is taught.

Nankai discloses an improved enzyme electrode which is made up of a first electrode having one or more enzymes immobilized upon it and a second electrode which functions to remove materials which may interfere with the detection to be carried out by the first electrode. To accomplish electrochemical detection using this electrode, both the first and second electrode are submerged in the test solution. The second electrode serves to electrochemically oxidize any interfering substances as the detection is accomplished by the first electrode.

Bockowski discloses a sensor electrode utilized in the presence of one or more filters made of such materials as adsorbents, such as activated carbon. The sensor electrode and the filters are located within close proximity to one another and are contained in an electrode support housing.

Finally, Amano discloses an apparatus to be used to measure free and total sulfurous acid. The apparatus contains a heating trough, a cooling trough, a reaction trough, and an independent source of buffer solution. No control means is taught nor is there any suggestion or indication of any means by which compounds interfering with the accurate detection of free sulfurous acid may be eliminated.

A cited reference cannot anticipate an invention unless it teaches or discloses each and every element of the claimed invention. Six of the seven art references cited by the Examiner as the basis of her § 102(b) rejections describe electrochemical biosensors for use in the detection of various substances, while the seventh describes a process for measuring sulfurous acid using live bacterial cultures. None of the references teaches the control means of the present invention for placing a sample solution in a proper condition for subsequent detection by a biosensor. Therefore, none of the references contains each and every element of the claimed invention, and, because of this deficiency, none can be the basis of a § 102(b) rejection.

In contrast to the apparatuses taught in the prior art cited by the Examiner, the present invention is a sample solution treating instrument having an introducing part and a releasing part for introduction and release of the sample solution, and a control means for converting a sample solution to a condition for analysis using a biosensor. None of the references cited by the Examiner teaches the control means of the present invention. The interferant-reducing means in the cited prior art are physically or chemically coupled with the detection portion of the biosensor. The interferant eliminating layer of Heller is sandwiched in between the reactive layers on the surface of the biosensing electrode. The isoenzymes of Foulds are incorporated into the test element of the dry strip. The oxidizing electrode of Nankai is proximate to the detection electrode, and performs its oxidation function almost simultaneously with the detection process of the other electrode. The filters of Bockowski are located adjacent to the sensor electrode, and are contained in close proximity in an electrode support housing. Neither of the biosensors taught in either of the Yoshioka references contain any control means; the enzyme taught in those references are used in the detection reaction.

Finally, Amano teaches only a "heating trough" for use in a process for detection of sulfurous acid. No control means is present in the disclosure of Amano.

Contrary to the prior art, the present invention allows for use of one biosensor for numerous different samples, reduction in the size of the apparatus used and the amount of sample required. Finally, because the control means is separate and distinct from the biosensor apparatus, the sample is properly adjusted, thereby better ensuring an accurate measurement by the biosensor.

In light of the foregoing, it is respectfully requested that the Examiner reconsider and withdraw her §102(b) rejections.

### **CONCLUSION**

For the reasons discussed above, it is submitted that the claims are fully compliant with 35 U.S.C. §112 and patentably distinguish over all art of record and known to applicants. Accordingly, reconsideration and allowance of the claims are earnestly solicited.

Respectfully submitted,

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DATE

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